

REMARKS

Claims 1-11 were pending.

Claims 1-11 are rejected.

Claims 1 and 10 are amended.

Claims 3, 6, 8, 9 and 11 are cancelled.

Claim 12 is new.

Claims 1-2, 4-5, 7, 10 and 12 are pending.

Claim 1 amendment

Claim 1 is amended to limit the substrate to sewage sludge. Support for this amendment may be found on page 5, lines 1-2.

Further the reverse phase polymer is defined having an IV of at least 3 dL/g and which polymer is cationic and formed from one or more ethylenically unsaturated cationic monomers optionally with one or more nonionic monomers and the cationic monomers are selected from the group consisting of dialkylamino alkyl (meth)acrylates, dialkylamino alkyl (meth) acrylamides acid addition or quaternary ammonium salts thereof and diallyl dimethyl ammonium chloride and the nonionic monomer is selected from the group consisting of acrylamide, methacrylamide, hydroxyethyl acrylate and N-vinylpyrrolidone.

This amendment is supported by the disclosure on page 7, lines 20-30 and claim 11.

Claim 12 is new and supported by the disclosure on page 11, lines 6-7.

No new matter is added.

35 USC 103(a)

Claims 1-11 are rejected under 35 USC 103(a) as being unpatentable over WO02/072482, Weir in view of Stevenson, US5,370,800.

Examiner believes Weir to disclose a process substantially as claimed. The difference between Weir and the present process is the polymer only partially inverts and then fully inverts during the

dewatering to form a cake. Examiner opines that Weir would appear to do the same since Weir uses the same polymers and amounts on the same types of aqueous suspensions.

The examiner believes that the instant claims differ from Weir by reciting that the process includes producing a thickened suspension by the release of free water by free drainage or filtration, and subjecting the thickened suspension to mechanical dewatering to form a cake.

Examiner uses Stevenson to make up for this deficiency. According to the examiner Stevenson discloses that it is known to mix waste water or a suspension with a first flocculating polymer, remove water from the flocs in a rotary thickener and mix a second flocculating polymer with the flocs and dewater in a filter press to produce a pressed cake solids. Thus according to the examiner it would be obvious to modify the process of Weir by utilizing the recited thickening and mechanical dewatering in view of the teachings of Stevenson, to aid in dewatering the suspension and forming a cake.

Applicants respectfully disagree:

Firstly, applicants would like to make clear what is meant by a reverse phase polymer. A reverse phase polymer as described by the invention is a water in oil emulsion or a substantially dehydrated polymer in oil dispersion. See page 8, lines 6-7. Thus a reverse phase polymer is a polymer which is emulsified or dispersed in oil. When the reverse phase polymer is inverted into water, for example, when inverted to form a solution of polymer in water which may be diluted to a concentration of 0.1 or 0.25 wt. %, the reverse phase polymer is no longer a reverse phase polymer since it is not a polymer dispersed or emulsified in oil but instead a solution of the polymer in water. Once inverted the previous continuous oil phase becomes dispersed in the aqueous solution of polymer.

Weir as agreed by the examiner does not suggest subjecting the thickened suspension to mechanical dewatering. Applicants point out that Weir also does not suggest **mixing of a thickened suspension in order to distribute the release polymer within the suspension**.

While Stevenson discloses that it is known to mix waste water or a suspension with a first flocculating polymer, remove water from the flocs in a rotary thickener and mix a second flocculating polymer with the flocs and dewater in a filter press to produce a pressed cake solids., Stevenson is

directed to dewatering of a mineral suspension, in particular removal of various precipitated or suspended metal compounds. The present claim is directed to dewatering of sewage sludge.

While Weir teaches reverse phase polymers, Stevenson does not. Applicants are not trying to argue the references separately, but to explain that it would not make sense to combine the additional process step of Stevenson and apply the additional process steps using the reverse phase polymer of Weir. Stevensons suspensions are mineral while Weir's are sewage. Stevensons polymers appear to be conventionally polymer solutions in water. See at col. 2, lines 20-22 wherein a flocculating agent from polymer tank 24 is also moved in line 26 to line 20 to be mixed etc.

As the Weir suspension (sewage) and polymers (reverse phase) and the Stevenson suspensions (mineral) and polymers (in water not oil) are fundamentally different, the applicants believe that one skilled in the art would not look to Stevenson and implement an additional step perhaps appropriate for Stevenson's very different substrate (mineral suspension) in a sewage suspension as presently claimed using a reverse phase polymer not remotely suggested by Stevenson.

Stevenson teaches in his mineral suspension that the preferred flocculating agent is an anionic or cationic polymer wherein the use of an anionic polymer would be preferred for primary clarification of setting purposes while the cationic polymer would be preferred for dewatering purposes. See col. 1, lines 42-48. Stevenson makes no suggestion to use reverse phase polymers at all.

Thus at a minimum claim 2 would be unobvious in light of the two references as it would not make much sense to rely on Weir's reverse phase polymer as a sole chemical dewatering treatment aid when Stevenson expressly teaches the use of a second flocculating agent for use in the thickened suspension. In other words, examiner is selecting the additional method steps taught in Stevenson, and combining with Weir but ignoring how those steps are implemented within Stevenson, that is by using two separate polymer flocculants (at least in regard to claim 2).

Further, Weir would also not be embraced by claim 2 because even when a reverse-phase polymer is used in Weir it is used in combination with an aqueous solution which is clearly not a reverse-phase polymer but an inverted polymer in water.

Additionally, applicants invite the examiner to look at the results shown in Weir Tables 1, page 7 and Table 2, page 9. It is clear that simultaneous addition of an inverted reverse phase polymer and a

reverse phase polymer (0.1% and 50% concentration compositions at different addition points to the sewage sludge) show marked improved filtration over single dosing of 0.1, 0.25 of inverted reverse phase polymers and 50 wt. % reverse phase concentrations. In fact, the dual addition in Weir is the limitation upon which the Weir invention relies.

One skilled in the art looking at Weir is directed to the use of simultaneous addition of both inverted reverse phase (dilute) and reverse phase (concentrated) in sewage sludge substrates because this shows much improved filtration.

However, the single addition of 50% reverse phase and 0.25% and 0.1% inverted phase polymer results in Weir are highly instructive especially when compared to the single addition of reverse phase polymer as taught in experimental procedure A, data set 1 in the present application.

Examiner has opined that the process of Weir would appear to invert in the suspension and release sufficient polymer to bring about flocculation, thickening and cake formation as in the instant process, since the same polymers and amounts appear to be utilized to dewater the same types of aqueous suspension.

It is agreed that the polymers of Weir are similar as those presently exemplified. Weir exemplifies reverse phase emulsion copolymers of cationic acrylamides of an IV of 10 dl/g and 9/dl/g at 50% concentration (examples 1 and 2 of Weir).

The present disclosure exemplifies a reverse phase emulsion cationic acrylamides of an IV of 9 dl/g.

Experimental procedure A, data set 1 is similar to the procedure followed in Weir except that Weir does not suggest thickening of the treated suspension and further mixing of the thickened suspension in order to distribute the release polymer within the suspension. Nor does Weir suggest or carry out mechanical dewatering. One can assume Weir was not aware that the additional steps would provide an improvement in his filtration results as Weir does not make any reference to such steps. Although the results of Weir cannot be directly compared to the presently disclosed examples the results are instructive in that Weir shows inferior filtration when using a single dose reverse phase polymer (50% concentration).

In contrast to Weir, applicants have found a way to improve reverse phase dosing by including an additional thickening and mixing and mechanical dewatering steps.

Applicants bring to the examiner's attention that the results in present Table 1, in particular the comparative results of test procedure A, data set 1 and test procedure B, data set 3.

The test procedure A, data set 1 shows addition of a reverse phase cationic polymer but includes the additional steps of mixing of release polymer in the thickened sludge and mechanical dewatering. This method as presently claimed is compared to the method B which has no thickened sludge mixing step.

It is clear that the % cake solids for data set 1 is far superior to that shown in data set 3 and that the reason for the enhanced cake solids is the mixing of the thickened sludge as that is the only difference between the two data sets.

Data set 2 is also informative as this test uses an inverted polymer (0.25 w/v) not a reverse phase polymer and omits mixing of the thickened sludge step entirely. Clearly this method not according to the invention gives the worst cake solids %.

Thus the applicants believe the present claims to be unobvious in light of Weir and Stevenson and commensurate in scope with the claims summarized as below:

- Weir is directed to sewage sludge while Stevenson is directed to mineral flocculation. There is no particular reason why one looking for better cake solids in sewage sludge flocculation would consider the additional mixing of the thickening suspension in Stevenson and apply to the process taught in Weir.
- Additionally, Stevenson makes no suggestion to use reverse phase polymers. Thus it is even more unclear why one skilled in the art would look to Stevenson and implement a process variation on the method of Weir when the substrate and polymer forms taught in Stevenson differ significantly from those in Weir.
- Further in regard to present claim 2, which is directed to a process in which the reverse phase polymer is the sole chemical dewatering treatment aid, Weir teaches the addition of two separate polymers- a reverse phase in combination with an inverted polymer. Stevenson also teaches the addition of two separate polymers. Thus at least in regard to claim 2, the use of a

reverse polymer as the sole chemical dewatering treatment would be unobvious in light of the two references.

- The selective extraction of a particular step of Stevenson without also observing the dual flocculant addition of either Stevenson or Weir would be just that selective extraction while ignoring other teachings within Weir and Stevenson in order to arrive at the present claim 2 limitations.
- Weir's examples indicate he was not remotely aware that mixing of a thickened sludge would improve volume of filtrate. Examiner has noted that the polymers used in Weir are similar to those utilized in the present process. Although the polymers are similar, the results when contrasted with those presently exemplified indicate that indeed the thickening step of the suspension wherein a release polymer is further mixed within the thickened sludge is important and gives unexpected improved cake solids.
- The contrast between present data sets 1 and 3, indicate that the mixing step for the thickened sewage sludge is key and lead to surprising results.
- And finally, the scope of the claims has been narrowed to reflect the scope of polymers exemplified.

In the event that minor amendments will further prosecution, applicants request that the examiner contact the undersigned representative.

Respectfully submitted,



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